

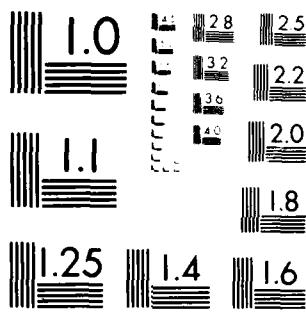
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DEFENCE FOOD RESEARCH ACTIVITIES REPORT(U) ARMED FORCES 1/1  
FOOD SCIENCE ESTABLISHMENT SCOTTSDALE (AUSTRALIA) 1983  
AFFSE-2/83

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Armed Forces Food Science Establishment  
Scottsdale, Tasmania

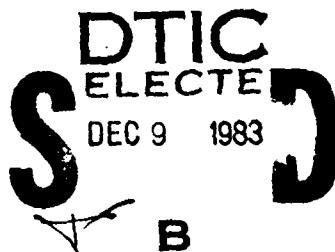
AFFSE REPORT 2/83

# DEFENCE FOOD RESEARCH

# ACTIVITIES REPORT

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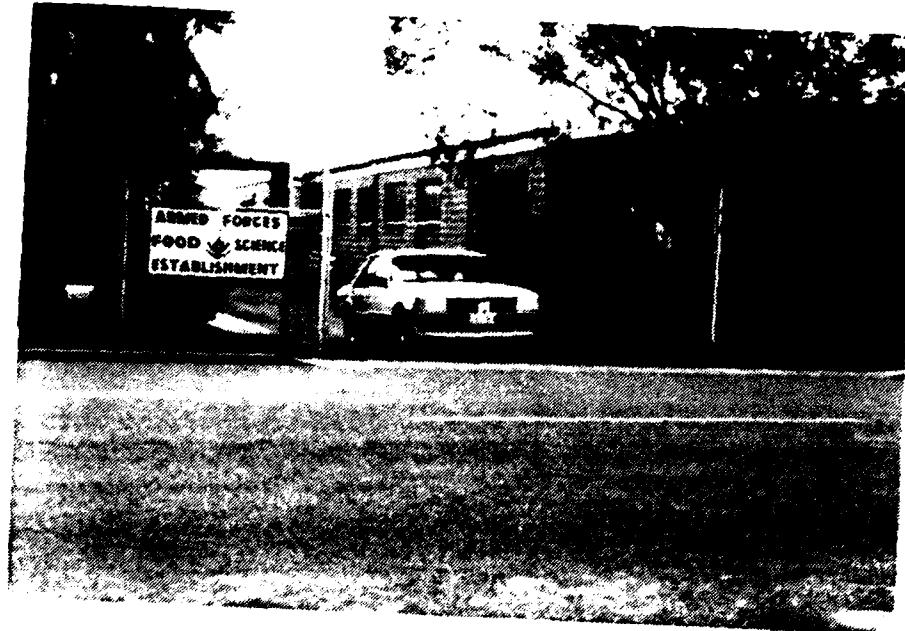
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DEFENCE FOOD RESEARCH

ACTIVITIES REPORT

1978-83

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DEFENCE FOOD RESEARCH

ACTIVITIES REPORT

SUMMARY

Highlights of the research and development programs in defence food science conducted at the Armed Forces Food Science Establishment during 1978-83 are described.

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COMMONWEALTH OF AUSTRALIA, 1983

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*Postal Address:* Defence Food Science Adviser,  
Armed Forces Food Science Establishment,  
P.O. Box 147,  
Scottsdale, Tasmania, 7254.

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## INTRODUCTION

This summary report of the activities of the Armed Forces Food Science Establishment (AFFSE) covers the period 1978-1983 and continues the series which started in 1958.

The report has been prepared as an information document for consideration by member countries of the Commonwealth Defence Science Organisation (Food Study Group) and is not a detailed report on all the scientific activities of the AFFSE. The report does, however, include titles of publications produced since 1978 and enquiries on the research and development program of the AFFSE are welcomed.

They should be addressed to the:

Defence Food Science Adviser,  
P.O. Box 147,  
SCOTTSDALE, Tasmania, 7254,  
Australia.

*Ross J. Richards*  
    

Dr. R. J. Richards

Officer-in-Charge AFFSE, and  
Defence Food Science Adviser.

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## ACTIVITIES REPORT

The Defence Science and Technology Organisation (DSTO) of which the AFFSE forms an integral part has been the subject of numerous reviews since the 1978 Food Study Group Conference. During the implementation of certain aspects of these reviews the Service Laboratories and Trials Division, which formerly encompassed the AFFSE, has been disbanded. Currently the Officer-in-Charge of the Establishment reports through the Director of the Materials Research Laboratories (MRL) to the Chief Defence Scientist.

These changes have brought with them a restatement of the roles and functions of the Establishment. In practical terms these remain unchanged and the Establishment continues to enjoy excellent relations with all branches of the Armed Services.

The new administrative structure, however, offers opportunities for joint projects with MRL staff. Advantage has already been taken of MRL resources and liaison between staff has been established in the areas of packaging, and physiology.

The AFFSE continues to pursue its research and development role in Defence food science. In accordance with the functions of DSTO the work at the Establishment is directed towards providing scientific and technical advice on Defence policy. In addition, the AFFSE provides scientific and technical support to the Australian Defence Force by assisting in design and development and ultimately acquisition of prototype feeding equipment and feeding systems. Thus the basic charter of the Establishment is fulfilled.

## ACTIVITIES OF THE SECTIONS

### FOOD TECHNOLOGY AND EXPERIMENTAL PROCESSING

The major portion of the Experimental Processing's time is spent servicing the speciality requirements of the Australian Armed Forces. Major activities include production and packaging of freeze dried, composite meals and components, emergency rations and drinking water. Other speciality items are occasionally packed as required.

Food Technology has continued to study the freeze drying process, and in conjunction with Engineering has produced an increase in freeze dried yield averaging 45% during the period 1974-1979. This is related to changes in formulation (particularly wet to dry ratio), loading densities and freeze drier operating parameters (e.g. platen temperatures). More recently, further increases in throughput rates have been achieved with rice by reanodising of freeze drier trays. This has permitted increased tray loading and an improved uniformity of spread. Experimentation is continuing to increase solids ratio on rice by lowering temperature and increasing cooking time.

A watching brief continues to be kept on the Australian Food Manufacturing Industry for any item suitable for inclusion in the operational ration packs. This applies particularly to the introduction of retort pouches and to possible replacements for the PVC emergency water pouches. Plastics readily available at present do not have the strength required to withstand ejection forces.

Meat texture work has continued. A study of accelerated ageing has shown that ageing at 60°C affects not only the myofibrillar proteins, but makes the connective tissue proteins much more susceptible to the effects of high temperature cooking. The effects of high temperature ageing on instrumental measures of freeze dried meat texture is being explored.

Preliminary work has been conducted on removal of unbound water from meat by centrifugation prior to freeze drying. However, centrifugal forces required for removal tend to lead to excessive breakdown of meat texture.

Preliminary work on the spray drying of instant gravies, and use of various modified starches and other thickening agents has commenced. It has been confirmed that most textural damage suffered by starch gels occurs at the freezing stage during freeze drying. Although chemical modification of the starches such as cross linking offers some protection, results obtained at the Establishment are at minor variance with the information supplied by the manufacturers. The effects of improved viscosity on the rate of meat rehydration have not yet been determined.

A feeding system based solely on the use of microwave ovens is being developed for use in Mine Hunter Catamarans (MHCAT). This may have spinoffs into other areas of Naval Feeding, particularly for heavy weather meals in other small craft. Factors that need to be considered are ease of preparation, and problems with lack of variety and boredom. Trial meals have been obtained from a hospital cook freeze catering system. These appear to have advantages over commercially available meals both from an organoleptic and microbiological aspect.

A new In-flight Ration Scale has been developed and is currently undergoing trial. The scale of issue for crews and passengers on transport aircraft has been finalised and work is continuing on a scale for strike aircraft crews. Both the In-flight Feeding Scale and MHCAT feeding systems are being undertaken by the combined Food Technology and Nutrition/Physiology sections.

#### NUTRITION/PHYSIOLOGY

The Ration Scales Committee has revised the Ration Scale. They have attempted to make alternatives more isocaloric than in the previous scale. This has resulted in a reduction in the spread of energy available from a range of 18,600 kJ (8,769 to 27,360 kJ) to one of 10,900 kJ (11,200 to 22,120 kJ). The new scale, SUPMAN 4, was introduced into service in December, 1982, and is titled the Australian Defence Force Ration Scale (ADFRS).

A study on the food intake and energy expenditure of naval clearance divers has been completed. Energy and nutrient intakes were found to be sufficient and without excessive wastage. Energy expenditures were high, averaging 19,000 kJ per day. Any problems with the feeding system did not appear to be related to the quality or quantity of food, but there was a lack of time for eating meals or for resting and sleep.

A study of more than 200 servicemen undergoing training is nearing completion. There is a large variation in apparent energy available between units, with little apparent difference in energy expenditure. Even in cases where energy availability is low, it remains in excess of that required by the trainees. A further study will be conducted early in the new period. In this case plate waste and anthropometric details of the trainees will be quantified. It is hoped that the trial will encompass the four year training period and will be conducted in conjunction with unit medical officers.

#### FOOD SCIENCE

##### A. Chemistry

Ration pack analysis has continued on a regular basis, with results published annually as AFFSE reports.

A major emphasis has been placed on new methods of analysis. High pressure liquid chromatographic methods for ascorbic acid and B group vitamins are under development. An interesting finding is that the dichloroindophenol method for ascorbic acid, over-estimates ascorbic acid in fortified coffee by a factor of two, or  $250 \text{ mg kg}^{-1}$ , due to naturally occurring chromophores in coffee.

The analysis of fibre components has commenced with examination of polysaccharide monomers. Although the method does not give detailed structures of fibre components, it will give an indication of total fibre and allow a broad classification of the physiological types. For instance uronic acid containing fibre reduces the availability of divalent cations such as calcium, ferrous iron and zinc.

Analysis has also been extended to a range of indigenous Australian foods. So far proximate analyses have been commenced on sixty bush foods which may be aids to sur-

vival. Initial results have shown that some species contain high concentrations of vitamins such as ascorbic acid and thiamin. It is planned to extend not only the number of nutrients for which analyses are being conducted but also the number and range of samples.

#### B. Microbiology

Regular sampling of AFFSE production has continued to verify that bacterial levels in freeze dried meals remain extremely low. Storage trials conducted at the Establishment have confirmed work at other research centres that numbers of viable bacteria are reduced during storage.

Research activity has been directed towards the assessment of the efficiency of water sterilizing tablets. A range of tablets has been assessed in both pure water and simulated contaminated water and at a range of pH values. More recently a practical approach has been adopted in the handling of water sterilizing tablets. The tablets after dissolution have been subjected to mild agitation which simulates more accurately field conditions. This work has been conducted in conjunction with other sections within the Establishment.

An evaluation has been made on a number of media which are used for enumerating yeasts and moulds. A short communication is currently under preparation.

In order to validate HPLC vitamin assays, microbiological methods for the analysis of niacin, riboflavin and pyridoxin are currently under development.

## THE ESTABLISHMENT

The Armed Forces Food Science Establishment (AFFSE) is situated in Scottsdale, a small rural town approximately 60 km from Launceston in the North-East of Tasmania. The original reasons for AFFSE's position in Scottsdale included a ready supply of dehydrated vegetables for experimental purposes from the processing factory situated alongside.

The staff now totals 32, and facilities include recently completed microbiology and chemistry laboratories equipped with modern analytical tools and a well equipped processing area for testing and small scale production of speciality foods to meet requirements for field testing or the training of the Armed Forces. Provision for storage testing of foods at elevated temperatures and humidities, and taste testing are also available.

A well equipped library, and engineering workshop supply necessary support to the Establishment.

AFFSE is tasked with the responsibility to supply scientific and technical advice to the Defence forces, on all matters relating to Defence feeding, procurement of foods and nutrition.

## STAFF

The following lists all staff as at 30th June, 1983.

**OFFICER-IN-CHARGE** Dr. R. J. Richards, B.Sc. Agr. PhD.

ASSISTANT OFFICER-IN-CHARGE Dr. R. Beyer, MRS.H. B.Sc. PhD.

## FOOD TECHNOLOGY & PROCESSING

Science 2	Vacant
Science 1	Mr. C. McManus, Dip. Appl. Sci. Food Tech.
Technical Assistant	Mrs. J. Brown
Sergeant Cook	Sgt. J. Harris
Supervisor	Mrs. D. Cusick
Food Processors	Mrs. A. Panten
	Miss G. Walker
	Miss J. Beggs
	Mrs. B. Abraham
	Mrs. K. Styles
	Mr. B. McDougall

## FOOD SCIENCE

Science 3	Mr. K. W. James, Dip. App. Chem. (Food Tech.) B. Pub. Admin.
Science 2	Mr. G. F. Thomson, B. App. Sci.
Science 1	Mr. C. H. Forbes-Ewan, B.Sc.
Technical Officers	Mr. P. Tattersall
	Mr. A. Hancock
Technical Assistant	Mrs. K. Walker

## **NUTRITION/PHYSIOLOGY**

<b>Science 3</b>	Dr. G. E. Driver, B.Sc. PhD.
<b>Science 2</b>	Mr. W. E. Badcock, B.Sc.
<b>Technical Assistant</b>	Mr. D. Waters

## ENGINEERING

Engineer	Mr. K. D. Hoey, Dip. Chem. Eng.
Technical Officer	Mr. L. Ranson
Maintenance	Mr. L. Aylett (On permanent loan from Dept. <i>of Transport &amp; Construction</i> )

## ADMINISTRATION

Administrative Officer	Capt. S. Smith, RAAOC
Library Officer	Mrs. E. Marriott (part time)
Clerical Assistant	Mrs. P. Martin
Steno Secretary	Mrs. D. Reid
Labourer/Driver	Mr. J. Mathews
Cleaner	Miss E. Rainbow
Stores	Sgt. F. Swiderski

## ARMY RESERVE OFFICERS

Maj. A. H. Fairbrother, B.Sc. (Fd. Tech) (1)

Lt.-Col. J. D. Harverson, B.Sc. (Fd. Tech) (2)

(1) Self Employed

(2) Faculty of Military Studies

Royal Military College

DUNTRON.

## PAPERS AND REPORTS

Badcock, W. E. 1978. "Australian Service Feeding Systems"  
CDSO FSG Symposium, Toronto, Canada.

Badcock, W. E. and Lichtenstein, D. J. 1978. "Field Evaluation of Australian Ration Packs"  
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Venkata-Raman, S., Hoey, K. D. and Richards, R. J. 1978. "Effect of Processing Parameters on Long Term Storage of Composite Meals". CDSO FSG Symposium, Toronto, Canada.

## LECTURES GIVEN BY AFFSE STAFF

Badcock, W. E. "Survival Rations for Tasmanian Bushwalking".  
Australian Sports Medicine Federation, Wilderness Medicine Workshop, Waddamana,  
November, 1980.

Badcock, W. E. and Lichtenstein, D. J. "A Nutritional Evaluation of the Australian Defence Force Ration Scale", Nutrition Society of Australia, 7th Scientific Meeting, Melbourne, November, 1980.

Beyer, R. "Quality Assurance in Defence Feeding" Australian Organisation for Quality Assurance,  
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